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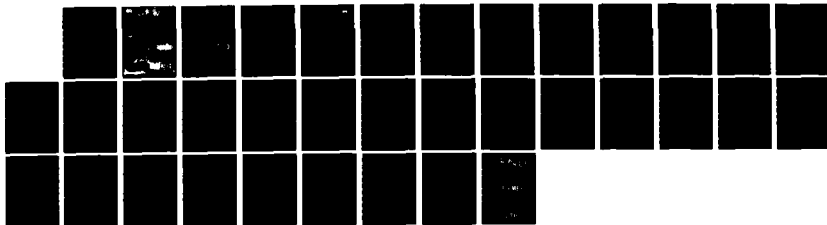
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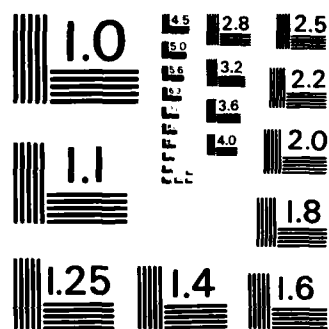
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ELECTRONIC EXCHANGE  
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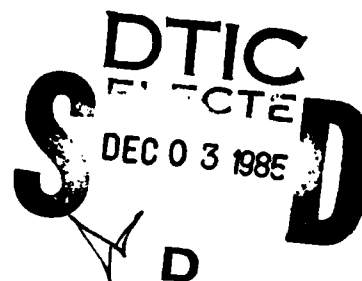
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ELECTRONIC EXCHANGE  
OF  
TRANSPORTATION SHIPMENT INFORMATION

November 1985

Thomas W. Heard  
William R. Ledder



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## PREFACE

Companies have traditionally used paper exchanges to conduct external business transactions, particularly those associated with ordering and receiving cargo. Examples include purchase orders, invoices, shipment documentation, and checks. Computers have started to ease the burden of these paper exchanges, but much more reduction is still being sought. One concept, commonly referred to as Electronic Data Interchange (EDI), shows considerable promise. This report explores private industry developments in the application of EDI to transportation and outlines a program for demonstrating its usefulness to the Department of Defense.

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## Executive Summary

### ELECTRONIC EXCHANGE OF TRANSPORTATION SHIPMENT INFORMATION

The transportation industry is beginning to cut burdensome paperwork by transferring shipment information electronically. One concept, Electronic Data Interchange (EDI), shows considerable promise. Based on widely accepted standards for air, motor, rail, and ocean modes, EDI provides a framework for computer-to-computer exchange of data between otherwise incompatible systems of independent shippers, carriers, and receivers.

The time has come for the Department of Defense to reduce paperwork in its transportation operations. We recommend a demonstration of the electronic interchange of transportation shipment information. The demonstration, using the EDI concept to the maximum extent practical, should focus on computer-to-computer exchange of Government Bill of Lading (GBL) information. It should make use of readily available vendor software and be designed to run initially in parallel with existing operating systems. Participants should include the Military Departments, the Defense Logistics Agency, the Military Traffic Management Command, one or more carriers, and finance centers responsible for the payment of GBLs.

Such a demonstration will identify problems associated with applying EDI to defense transportation and establish a foundation for expanding its use. Subsequent application should reduce duplication of effort, improve accuracy, and lower costs.

## TABLE OF CONTENTS

	<u>PAGE</u>
PREFACE . . . . .	ii
EXECUTIVE SUMMARY . . . . .	iii
<u>SECTION</u>	
INDUSTRY USE OF ELECTRONIC DATA EXCHANGE . . . . .	1
ELECTRONIC EXCHANGE IN DEFENSE TRANSPORTATION . . . . .	3
Current Standards . . . . .	3
Current DoD Experiment . . . . .	3
RECOMMENDED ACTION . . . . .	3
<u>APPENDIX</u>	
A. THE EDI CONCEPT	
B. DEVELOPMENT OF TRANSACTION SETS IN THE DEPARTMENT OF DEFENSE	
C. GOVERNMENT BILL OF LADING DOCUMENT FLOW	
D. DEMONSTRATION PLAN	

## **ELECTRONIC EXCHANGE OF TRANSPORTATION SHIPMENT INFORMATION**

### **INDUSTRY USE OF ELECTRONIC DATA INTERCHANGE**

The growth of computer and telecommunication technologies has significantly increased opportunities for the computer-to-computer exchange of business information. In 1979, the American National Standards Institute (ANSI), a coordinator and clearinghouse for information on national and international standards, chartered a committee to develop uniform standards for the electronic exchange of business transactions. The committee, known as X12, was tasked to develop standards for order placement, order processing, shipment, invoicing, and payment.

In developing those standards, the X12 Committee relied heavily on prior work performed by the Transportation Data Coordinating Committee (TDCC). The TDCC, a nonprofit organization, had for some time been sponsoring industry forums wherein technical teams representing shippers, carriers, banks, and other interested parties would gather to develop procedures or standards to facilitate the computer-to-computer exchange of data between independently designed and operated computer systems. The concept for Electronic Data Interchange (EDI) grew out of those procedures or standards.

The EDI concept is based on transaction sets that define the format and data content requirements for specific business transactions, such as invoicing. They also provide a standard master list, or data dictionary, that defines the precise content for building transaction sets and transmission control standards that permit electronic exchange. (Appendix A provides more details on the structure of the standards and shows the transaction sets that have already been developed for the transportation industry.)

The transportation industry has recognized the potential of EDI standards for many years; EDI standards for the air, motor, rail, and ocean modes have existed for 10 or more years. Although those standards are widely accepted, shippers have only recently made the investments in computer



hardware and software that make electronic interchange of transportation information an everyday occurrence. The reasons for these investments include the need to reduce inventory through more timely and accurate shipment information, the need for better cash management, the need to simplify computer operations and interfaces, and the need to reduce administrative costs.

Most of the private sector investments in EDI transportation applications are concentrated in three functional areas.

- Shipment Information. This application permits computer-to-computer exchange of bill-of-lading and manifest information to carriers and other interested parties.
- Inquiry and Reply. These applications facilitate electronic tracing inquiries and exchange of shipment location, identity, and status information.
- Invoicing and Payment. These applications permit computer-to-computer exchange of freight details for billing and payment purposes and authorize banks to release funds for the payment of transportation services.

Based on discussions with shippers, carriers, and various business associations, we believe that transportation industry investments in EDI applications will continue to grow. The growth is likely to concentrate initially on the invoicing and payment functions but will spread to encompass all paper-intensive transportation functions. The lower costs for computers, particularly microcomputers, a growing commercial telecommunications network, and increased reliance on contract carriage are combining to create an environment that is ripe for an EDI explosion.

To support this growth, an EDI service industry is developing to meet the needs of shippers, carriers, and other transportation-related businesses. Several companies already are marketing computer software in the EDI format for microcomputer, minicomputer, or mainframe applications. Some of these companies also are providing management support, systems development, implementation services, and software maintenance. To a large extent, much of the systems development entails creating a format for interfacing with the vendor's EDI software. We believe that this small but growing service industry will be fueling many of the new EDI applications.

## ELECTRONIC EXCHANGE IN DEFENSE TRANSPORTATION

### Current Standards

The electronic exchange of information is not new to defense logistics. In fact, much of the original EDI concept grew out of approaches used by the Defense Logistics Standards Systems (DLSS). The DLSS, consisting of 14 standard logistics systems and programs, provide uniform policies and procedures for the interchange of logistics data among Department of Defense (DoD) components. One of the 14 systems, the Military Standard Transportation and Movement Procedures (MILSTAMP), was designed to permit automated transportation document flow through a common language of codes and addresses, but it is antiquated and its scope is narrow (it does not, for example, provide a standards system for movements within the continental United States).

The DoD recently launched an extensive program, Modernization of DLSS (MODELS), to upgrade the DLSS, including MILSTAMP. Although that program is still in the planning stage, many of its design objectives appear to be compatible with the EDI concept that already is being used daily by the transportation industry.

### Current DoD Experiment

The Military Traffic Management Command (MTMC) is experimenting with the EDI concept on a limited basis. In a project entitled Automated Carrier Interface (ACI), MTMC will use some of the EDI standards to offer and book containerized cargo electronically with several ocean carriers. Other transportation functions that will be accomplished on a computer-to-computer basis within the ACI project include shipment inquiry, shipment status, invoicing, and payment. Altogether, at least six EDI transaction set standards will be used to improve the timeliness of processing cargo movements and increase the accuracy of information flow through reduced manual intervention. Implementation of the ACI system is scheduled for late 1985.

### RECOMMENDED ACTION

We believe that use of the EDI concept to exchange transportation shipment information electronically has the potential to reduce both paperwork and costs substantially at DoD activities. To demonstrate that potential and to keep pace with private sector developments, we recommend that

the Assistant Secretary of Defense (Acquisition and Logistics) sponsor a demonstration of electronic exchange of DoD transportation information using the EDI concept to the maximum practical extent.

Although DoD uses 38 different documents or formats in carrying out its transportation responsibilities (see Appendix B for more details), the best candidate for a demonstration of electronic transfer would be the Government Bill of Lading (GBL).

First, the GBL is a major paper generator. As the primary document used to procure commercial transportation services, the DoD creates more than 1.5 million GBLs each year. Since a typical GBL document comes in 7 parts, GBLs alone create 40,000 pieces of paper each working day.

Second, the GBL is used by all major transportation activities and has multiple internal applications. For example, a single shipment from a wholesale supply depot results in a copy of a GBL or GBL information being sent to at least four DoD activities: the consignee or receiver of the shipment; an MTMC area command; Headquarters, MTMC; and a finance center. Additional GBL copies or photo copies may also be sent to the shipper's higher commands. (Appendix C provides more detail on the flow of the GBL throughout the DoD.)

Third, the GBL results in considerable duplication of effort. At most major supply depots, the GBL document is automatically printed by the depot's operating system. This means an electronic image of the GBL is resident in the depot's computer. But, when a finance center receives the original copy of the GBL from the carrier, it manually enters into its own computer more than 90 elements of information, all taken from the GBL.<sup>1</sup> About 8 to 10 elements of information are entered into the finance center's operating system to process carrier payments. The remaining elements of information are captured for the MTMC's Freight Information System, which permits analysis of traffic patterns and costs.

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<sup>1</sup>The DoD uses three finance centers to pay GBL freight bills: the U.S. Army Finance Center in Indianapolis, Indiana, the Navy Material Transportation Office in Norfolk, Virginia, and the Marine Corps Logistics Base, Albany, Georgia. Many of the people employed at those centers are involved in the process of capturing information from the GBL document and entering it into their computer systems.

Finally, the GBL offers a good vehicle for expanding EDI applications within the DoD because many of its data elements (which number more than 90) are used in numerous other transportation transactions. Consequently, once the EDI standards have been developed for the GE', many additional applications will follow.

The key design features of the recommended demonstration include:

- Participants. At a minimum, participants should include a DoD shipper from the wholesale distribution network, several consignees to assure participation by each of the Military Departments, one or more carriers, a finance center to examine billing and payment applications, and MTMC which uses GBL data to analyze traffic distribution and cost.
- Hardware. Microcomputers should be used. Such use will result in less disruption to existing mainframe operating systems and will hold demonstration costs to a minimum.
- Software. Readily available vendor software should be used. However, some small-scale interface software will need to be developed; that software will require both vendor and in-house support.
- Telecommunications. Commercial telecommunication networks should be used, and they should be supplemented with a value-added, electronic mailbox, telecommunication capability.
- Volume. Initially, only a few GBLs should be interchanged electronically. The number will grow as the participating activities become accustomed to exchanging GBLs electronically.
- Cost. Each activity participating in the demonstration will (in our estimation) incur installation cost in the range of \$16,000 to \$26,000 and monthly operating costs of approximately \$1,900 to \$3,000.

Appendix D describes the demonstration in more detail, identifies and explains each of the cost components, and presents a timetable for conducting it.

We believe both short- and long-term benefits will accrue from the demonstration. In the short term, the problems associated with applying EDI techniques to defense transportation will be identified and possible solutions developed. In the long run, successful adaptation of EDI techniques promises to reduce duplication of effort, improve the accuracy of information flow, and reduce the amount of paperwork needed to move cargo within the Defense Transportation System, thereby reducing costs.

## APPENDIX A

### THE EDI CONCEPT

The Electronic Data Interchange (EDI) concept uses electronic communications to transmit data between incompatible hardware and software systems of independent users. The concept consists of transaction set standards, a standard data dictionary, and telecommunications standards. This appendix describes each of those standards and then presents the key features of the EDI concept.

#### EDI STANDARDS

##### Transaction Set Standards

The Transportation Data Coordinating Committee (TDCC) has published EDI standards for the motor, rail, air, and ocean carrier industries. Those standards provide a format for electronic transmissions in 11 functional areas. Examples of functional areas include Shipment Information, Invoicing, Inquiry and Reply, and Payment and Banking. Within each of the functional areas, TDCC has developed specific transaction sets. A transaction set is the electronic equivalent of a document or message relating to some business function. To date, almost 100 transaction sets have been created for the motor, air, ocean, and rail modes. (Those transaction sets are shown in Figures A-1 through A-4, which appear at the end of this appendix.)

A transaction set is composed of a series of data segments, corresponding to a line of information in a document. In turn, data segments are comprised of one or a series of data elements. The data element is the smallest unit of information in the EDI transaction set framework. It may consist of an alphabetic and/or numeric descriptor of some basic piece of data.

##### Data Dictionary

The EDI data dictionary identifies and defines each data element in a table format. The table of data elements is the building block for all data segments and transaction sets used in EDI business functions. For each data element, the dictionary shows its number and name; provides a

functional description; identifies the field-length range; and designates whether it is alphabetic, numeric, or a combination. The data dictionary also provides a reference designator, which is a list of the data segments in which the data element occurs. The reference designator is used for standards maintenance and updating.

The Joint Electronic Data Interchange Committee has successfully bridged the differences between the TDCC and the American National Standards Institute (ANSI) X12 Committee and developed a standard data dictionary. This data dictionary, which is scheduled for approval by TDCC and ANSI in December 1985, includes all business functions.

### Telecommunications Standards

Telecommunications standards permit each EDI user to transmit and receive information without a translation service. The key characteristics of those standards include line protocol, transmission speed, transmission times, service levels for value-added networks, security identifications, transmission mode, transmission code, and message acceptance/rejection requirements. While industries such as grocery and electrical already have adopted standards for telecommunications, the transportation industry has not. Nevertheless, the telecommunications standards exist and should form the basis for those used in the proposed Department of Defense demonstration.

### KEY FEATURES

The EDI transmission structure of data elements, data segments, and transaction sets is identified and related through a table format. This approach, together with recent advances in telecommunications and hardware systems, gives the EDI concept several key features. Some of these features are listed below:

- Systems Independence. The transaction set standards and telecommunications standards give independent users the capability to communicate, even though they use incompatible hardware and software systems.
- Communications Independence. The EDI telecommunications standards allow users to establish communication services jointly.
- Limited Internal System Redesign. Since the EDI software augments existing systems, the user's internal applications remain unchanged.

- Easy Standards Modification. The table-driven software accommodates updates to existing edit tables without affecting software logic.
- Variable Information Flow. The EDI standards, which are based upon variable field-length formats and mandatory, optional, and conditional data element and data segment designators, permit users to eliminate unnecessary data from any transmission and thus minimize communication sessions and costs.
- Data Security and Control. The EDI software conducts edit checks before and after transmission to ensure accuracy. It also provides for mandatory functional acknowledgments or rejection messages from the receiver to the sender on the status of completed transmissions. Its security measures include unique addressing and dialing codes and other conventions mutually agreed upon by users.

In summary, these features are designed to minimize changes to internal operating systems and facilitate the secure transmission of only needed data between incompatible hardware and software systems.

**FIGURE A-1. TRANSACTION SETS FOR MOTOR CARRIER EDI STANDARDS**

**A. SHIPMENT INFORMATION**

- 204 Shipment Information
- 205 Container/Equipment Transfer
- 206 Shipment Pick-up Order
- 207 Shipment Information for Export Declaration
- 208 Shipment Information for Import

**B. INVOICE**

- 210 Freight Details and Invoice
- 211 Freight Details and Invoice Summary
- 800 Commercial Invoicing

**C. INQUIRY/REPLY**

- 213 Inquiry
- 214 Shipment Identities and Status Reply

**D. REPETITIVE PATTERN MAINTENANCE**

- 216 Repetitive Pattern Maintenance

**E. PAYMENT/BANKING**

- 900 Payment Authorization
- 901 Completed Payments
- 903 Carrier Remittance Advice

**F. CONSOLIDATION**

- 950 Consolidation Manifest
- 951 Status Information from Consolidator

**G. FUNCTIONAL GROUP TOTALS**

- 980 Functional Group Totals

**H. ADVISORY INFORMATION**

- 990 Generalized Feedback
- 995 Advisory Information

**I. ACCEPTANCE/REJECTION**

- 997 Functional Acknowledgment
- 999 Acceptance/Rejection Advice



**FIGURE A-2. TRANSACTION SETS FOR AIR CARRIER EDI STANDARDS**

<b>A. SHIPMENT INFORMATION</b>	<b>D. REPETITIVE PATTERN MAINTENANCE</b>
101 Flight Confirmation	116 Repetitive Pattern Maintenance
104 Shipment Information	<b>E. BANKING</b>
105 Container/Equipment Transfer	900 Payment Authorization
107 Shipment Information for Export Declaration	901 Completed Payments
108 Shipment Information for Import	<b>F. FUNCTIONAL GROUP TOTALS</b>
109 Shipment Information for Pick-up/Delivery Order	980 Functional Group Totals
<b>B. INVOICE</b>	<b>G. ADVISORY INFORMATION</b>
110 Freight Details and Invoice	990 Generalized Feedback
111 Freight Details and Invoice Summary	995 Advisory Information
800 Commercial Invoicing	996 File Transfer
<b>C. INQUIRY/REPLY</b>	<b>H. ACCEPTANCE/REJECTION</b>
113 Inquiry	997 Functional Acknowledgment
114 Shipment Identities and Status Reply	999 Acceptance/Rejection Advice
115 Status Details Reply	

**FIGURE A-3. TRANSACTION SETS FOR OCEAN CARRIER EDI STANDARDS**

A.	SPACE/BOOKING AND CONTAINER/ SPECIALIZED EQUIPMENT RELEASE		314	Shipment Identities and Status Reply
	300	Reservation (Booking Request)	315	Status Details Reply
	301	Confirmation	E.	REPETITIVE PATTERN MAINTENANCE
	302	Container/Specialized Equipment Pick-up Order/Cancellation	316	Repetitive Pattern Maintenance
	303	Cancellation	F.	BANKING
B.	SHIPMENT INFORMATION		900	Payment Authorization
	304	Shipment Information	901	Completed Payments
	305	Container/Equipment Transfer	G.	FUNCTIONAL GROUP TOTALS
	306	Dock Receipt	980	Functional Group Totals
	307	Shipment Information for Export Declaration	H.	ADVISORY INFORMATION
	308	Shipment Information for Import	990	Generalized Feedback
C.	INVOICE		995	Advisory Information
	310	Freight Details and Invoice	996	File Transfer
	312	Arrival Notice	I.	ACCEPTANCE/REJECTION
	800	Commercial Invoicing	997	Functional Acknowledgment
D.	INQUIRY/REPLY		999	Acceptance/Rejection Advice
	313	Inquiry		

**FIGURE A-4. TRANSACTION SETS FOR RAIL CARRIER EDI STANDARDS**

<b>A. SHIPMENT INFORMATION</b>	420 Car Handling Information
404 Shipment Information	<b>H. CAR MOVEMENT INFORMATION</b>
407 Shipment Information for Export Declaration	421 Industrial Switch List
408 Shipment Information for Import	<b>I. SHIPMENT WEIGHTS</b>
	440 Shipment Weights
<b>B. INVOICE</b>	<b>J. BANKING</b>
410 Freight Details and Invoice	900 Payment Authorization
411 Freight Details and Invoice Summary	901 Completed Payments
422 Straight Plan Demurrage	902 Payment Advice
424 Switch Bills	<b>K. CONSOLIDATION</b>
800 Commercial Invoicing	950 Consolidation Manifest
<b>C. INQUIRY/REPLY</b>	951 Status Information from Consolidator
413 Status Inquiry	<b>L. FUNCTIONAL GROUP TOTALS</b>
414 Status Information	980 Functional Group Totals
415 Fleet Reference Update	<b>M. ADVISORY INFORMATION</b>
<b>D. REPETITIVE PATTERN MAINTENANCE</b>	990 Generalized Feedback
416 Repetitive Pattern Maintenance	995 Advisory Information
<b>E. WAYBILL INTERCHANGE</b>	998 Set Cancellation
417 Waybill Interchange	<b>N. ACCEPTANCE/REJECTION</b>
<b>F. ADVANCE INTERCHANGE CONSIST</b>	499 Application Acceptance/Rejection
418 Advance Interchange Consist	997 Functional Acknowledgment
<b>G. EMPTY CAR INFORMATION</b>	999 Acceptance/Rejection Advice
419 Empty Car Advance Disposition	

**APPENDIX B**  
**DEVELOPMENT OF TRANSACTION SETS**  
**IN THE DEPARTMENT OF DEFENSE**

This appendix examines the use of transaction sets within the Department of Defense (DoD).

**POTENTIAL TRANSACTION SETS**

According to the Military Traffic Management Regulation (MTMR) and the Military Standard Transportation and Movement Procedures (MILSTAMP), the DoD has at least 38 potential Electronic Data Interchange (EDI) applications in the area of transportation. Many of those applications were first identified in an 1983 Air Force Logistics Management Center report entitled "MILSTAMP Improvement Program, Topic 12, Long-Range Conceptual Changes," by Captain James D. Davis and First Lieutenant Michael B. Fredette. Table B-1, which appears at the end of this appendix, identifies those 38 applications and provides a brief functional description of each. The transaction sets for many of these applications already are available in the private sector.

**TRANSACTION SETS BEING DEMONSTRATED**

The DoD is already experimenting with EDI transportation applications, but on a limited basis. In a project entitled Automated Carrier Interface (ACI), the Military Traffic Management Command (MTMC), together with the Military Sealift Command (MSC) and three U.S. commercial ocean carriers, will electronically exchange booking, tracing, invoicing, and payment information for containerized shipments. At least six, and as many as eight, Transportation Data Coordinating Committee (TDCC) transaction sets will be used in these information exchanges. The following list shows the specific transaction sets being used in ACI and provides a brief description of that usage. The titles of the transaction sets are identical to those presented in Appendix A, Figure A-3, "Transaction Sets for Ocean Carrier EDI Standards."

- **#300 Reservation (Booking Request)**. This transaction set allows MTMC to provide the carriers with offering information.

- #301 Confirmation. This transaction set enables the ocean carriers to provide MTMC with booking information for each offering.
- #310 Freight Details and Invoice. This transaction set allows the carriers to provide MSC with electronic freight bills for completed shipments.
- #315 Status Details Reply. This transaction set allows the carriers to provide MTMC with electronic status and tracing information for intransit shipments.
- #820 Payment and Remittance Advice. This transaction set enables MSC to provide the carriers with information on completed payments. This transaction set is scheduled to be published in September 1985.
- #999 Acceptance/Rejection Advice. This transaction set gives all participants the capability to provide information to the sender on the status of all received transmissions. (This is a standard control feature of all EDI transmissions.)
- #996 File Transfer. This transaction set may be used in later stages of ACI to transmit manifest information from MTMC to MSC for shipments loaded aboard commercial vessels.
- #304 Shipment Information. In future ACI development, this transaction set will give MTMC the capability to provide carriers with ocean bill of lading information.

Altogether, the ACI system will make use of six transaction sets immediately, with the possibility of adding two more transaction sets (numbers 996 and 304) in the near future.

#### GBL TRANSACTION SET

As discussed in Appendix A, TDCC has developed shipment information transaction sets for the motor, air, ocean, and rail industries. The GBL transaction set for the DoD demonstration should mirror these established standards. We believe that the TDCC Motor Shipment Information transaction set should be the model for the GBL transaction set.

The current differences between the MTMR GBL requirements and the TDCC Motor Shipment Information transaction set are minor. The TDCC standard contains 30 data segments composed of over 200 data elements. An initial assessment indicates that approximately 10 of those 200 data elements require adjustments to accommodate the GBL. Some of the adjustments to the commercial standards include increasing field lengths, while others require establishing locations for data elements peculiar to defense transportation, such as transportation priority and required delivery date. It is important that the DoD standard that ultimately emerges follow the standards established

by TDCC and the American National Standard Institute (ANSI) so that computer-to-computer communications are possible between defense and commercial organizations.

In addition to a GBL transaction set, other standards may need to be used during the demonstration and subsequent efforts. Some of these transaction sets, along with a brief functional description of each, are listed below:

- Acknowledgment of Receipt. This transaction set would give the consignee the capability to provide the finance center with condition and arrival information for each GBL. That information will enable the finance center to reconcile with the GBL and carrier freight bill before payment.
- Invoicing. This transaction set would enable the carrier to transmit freight billing information to the finance center for reconciliation with the GBL and consignee acknowledgment.
- Remittance Advice. This transaction set would give the finance center the capability to notify the carrier of completed payments electronically. (This transaction set is scheduled to be published for review in September 1985.)

**TABLE B-1. POTENTIAL TRANSPORTATION TRANSACTION SETS**

TRANSACTION SET	DESCRIPTION/PURPOSE
Shipment Information	Transmits all shipment information (such as Government Bill of Lading (GBL) or Transportation Control and Movement Document information) required by the carrier for shipment documentation and/or data records.
Tender/Tariff Information	Transmits all tender, tariff, and other rate information to MTMC in a <i>standardized tender format</i> .
Routing Request (Domestic)	Requests carrier, routing, and other data from MTMC data files.
Routing Response (Domestic)	Designates a mode, carrier, and other data in response to a routing request.
Tracer Request	Requests shipment status, location, and other intransit information from various DoD data bases.
Tracing Response	Responds with shipment status and location information to tracing request.
Export Offering	Requests an export release number for shipments that require them.
Export Release	Transmits routing information and export release number for export offerings.
Defense Freight Railway Interchange Fleet (DFRIF) Information	Transmits distribution, utilization, and maintenance information for DFRIF to MTMC.
Request for Discrepancy in Shipment Report (DisRep)	Requests information on missing, short, pilfered, stolen, wet, or other shipment exceptions for DisRep generation.
DisRep Response	Responds to DisRep request with information on the potential claim.
Government Transportation Request (GTR) Information	Transmits request for passenger transportation to commercial carriers.
GTR Response	Transmits rate and other contract information for GTR to MTMC.
Booking Offering	Offers a commercial carrier a potential shipment including all shipment particulars.
Booking Information	Advises MTMC that a shipment offering has been accepted by an ocean carrier.
Challenge	Preadvises shipper that particular air shipments are to be diverted to a surface mode.
Challenge Notice	Advises shipper that an offering must be placed in a "hold" status pending receipt of a challenge response.
Challenge Response	Advises the Transportation Operating Agency (TOA) that a challenge shipment is to be airlifted, partially airlifted and the remainder sealifted, or completely sealifted.

**TABLE B-1. POTENTIAL TRANSPORTATION TRANSACTION SETS (CONTINUED)**

TRANSACTION SET	DESCRIPTION/PURPOSE
Clearance Request	Requests clearance for use of public roads, equipment, etc., from the civil sector.
Clearance Response	Responds to clearance request with clearance number and other information.
Container Offering	Offers a loaded intermodal container for shipment and advises that the container is ready to be moved.
Diversion	Advises MTMC that a shipment is about to be or has been diverted from the mode given in previous shipping instructions.
Fleet Status	Transmits status information on vehicle fleet (such as availability, location, and maintenance information) for movement control purposes.
Lift Data	Transmits shipment status information to overseas locations.
Manifest	Transmits water or air manifests between controlling transportation groups, usually TOAs.
Movement Ready Notice	Notifies consignee or TOA that a shipment is available for carriage from the port of discharge.
Organic Lift Offering	Transmits notification to consignee that high priority items are ready for pick-up from the port facility.
Organic Lift Response	Transmits reply that high priority cargo will be picked up at the port facility or will move through normal channels.
Pallet Offering	Transmits notification that a shipment is complete and ready for delivery to the port of embarkation.
Pick-Up Instructions	Provides information (such as location, quantity, etc.) of cargo to be picked up by a military trucking company.
Receipt Data	Transmits notification of cargo receipt to MTMC data base for tracing purposes and movement control.
Shipment Notice	Transmits notification that a shipment is enroute to port for export.
Shipping Instructions	Transmits complete instructions from TOAs to all installations and agencies that will handle the material.
Shipping Request	Requests shipment clearance and movement instructions to MTMC from domestic vendors.
Freight Details and Invoice	Transmits all freight details and charges from carrier to finance center.
Payment Authorization	Authorizes release of payment to payee's bank.
Transfer of Funds	Transmits funds from finance center to payee's bank.
Completed Payments	Informs payee of settled accounts.



## APPENDIX C

### GOVERNMENT BILL OF LADING DOCUMENT FLOW

#### INTRODUCTION

The Government Bill of Lading (GBL) is used by agencies to procure transportation and related services from commercial carriers. In 1984, the Department of Defense (DoD) issued approximately 1.5 million GBLs. Since the GBL is a 7-part document with continuation sheets as necessary, those 1.5 million GBLs resulted in the creation of more than 10 million pieces of GBL paper. This appendix describes the flow of that paper throughout DoD.

#### GBL DISTRIBUTION

Any authorized transportation officer within DoD can issue a GBL. After it is signed by a transportation officer or designated agent, all copies are turned over to a carrier. The carrier acknowledges receipt of the GBL and the shipment by filling in the carrier's name, the date of receipt, and signing the GBL. After the original and all copies have been signed by the carrier, the GBL is generally distributed as follows.

- Carrier. The carrier keeps the original and three copies. The copies are for the carrier's own use; the original is later presented to a Government Finance Center for payment. After the shipment is delivered and the carrier has been paid, the original GBL and payment voucher are forwarded to the General Services Administration (GSA) for rate audit.
- Shipper. The office issuing the shipment retains one copy for its records.
- Consignee. The shipper forwards one copy to the consignee for information and planning purposes.
- Military Traffic Management Command (MTMC). The shipper forwards one copy to an MTMC Area Command for analyzing shipping activity and auditing GBL preparation.
- Finance Center. The carrier forwards the original GBL to finance center for payment.

Figure C-1 shows the flow of GBL copies among these key users. The balance of this appendix expands on the functional relationships among these users and describes, in more detail, their use of the GBL.

#### Shipper

The Army, Navy, Air Force, and Defense Logistics Agency (DLA) have each developed, at their depots, automated systems for generating GBLs. Those systems employ varying degrees of automation to combine supply system information with transportation data. They assign the GBL number and print the GBL as shipments become available for movement. However, all further processing is manual. Upon signature by the carrier, the original and three copies are released to the carrier. The shipper then retains one copy for its files and mails one copy to the consignee and another to an MTMC Area Command (weekly).

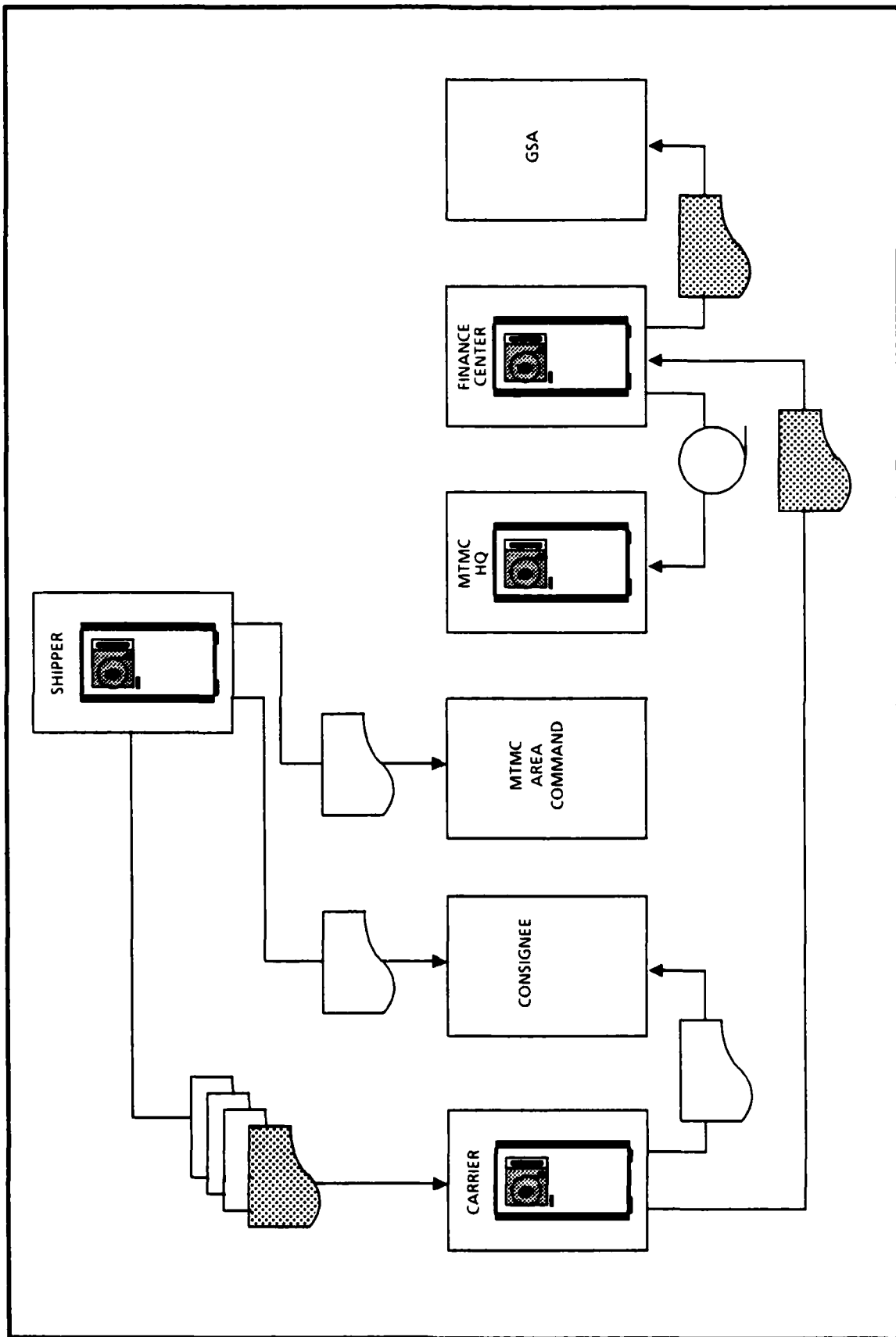
#### Carrier

The original GBL accompanies the shipment to the consignee where delivery dates, signatures, and other notations are made. The original is then returned to the carrier's accounts receivable section, which sends it, along with a freight bill and public voucher, to a finance center for payment. Copies of the GBL also may be sent to the shipping terminal, destination terminal, consignee, and general offices. Although many carriers process GBLs differently, they all use them to generate freight bills, trace shipments, and manage freight movements. As with the original GBL, one copy accompanies the freight to the consignee. The consignee retains this copy with all notations made at time of delivery.

#### Consignee

The processing of inbound GBLs is mostly a manual process. Upon receipt of an advance GBL, the consignee dates it and then files it by the last two digits of the GBL number. When the shipment arrives, the consignee matches the carrier documentation (usually the original and one copy of the GBL) with the advance copy. The consignee also notes the delivery date, the condition of the shipment, and other details on all documents. If the shipment is incomplete or damaged, then the consignee prepares a Discrepancy in Shipment Report and forwards it to the shipper and carrier.

FIGURE C-1. GBL DISTRIBUTION AND INFORMATION FLOW



### Finance Center

GBLs are paid by three DoD finance centers: (1) the U.S. Army Finance and Accounting Center (USAFAC), Indianapolis, Indiana; (2) the Naval Material Transportation Office, Norfolk, Virginia; and (3) the Marine Corps Logistics Base, Albany, Georgia.

USAFAC is the DoD's largest finance center, paying approximately 85 percent of all DoD GBLs, including those generated by the Army, Air Force, and DLA. It processes approximately 180,000 GBLs monthly for original freight movements, personal property shipments, and supplemental charges. The process begins with receipt of an original GBL and public voucher for transportation charges from the carrier. These documents certify that the shipment has been delivered. After manual review and edit, USAFAC personnel enter GBL billing data into remote terminals to begin the payment process. This process is totally automated, resulting in issuance of a check to the carrier.

A second data-entry process uses the original carrier-certified GBL to provide Headquarters, MTMC with specific data about transportation movement and billing. This process is similar to, but more comprehensive than, the payment process. Each day, USAFAC personnel enter GBL data through remote terminals and the mainframe computer for creation of a magnetic tape that is mailed to Headquarters, MTMC. MTMC then uses that information to update the Freight Information System (FINS). USAFAC personnel also microfilm all completed GBL packages and retains them for 3 months before sending the original paid GBL to GSA.

Typically, USAFAC uses 10 to 15 elements of data from the GBL for the automated payment process. It also inputs 90 to 100 data elements into the FINS data compilation. Altogether, USAFAC uses close to 100 remote terminals to build these 2 GBL data bases. Since, much of this information already is resident in the shipper's computer, the effort to recapture it is costly duplication.

### Military Traffic Management Command

Approximately 900 DoD shipping activities issue a total of 130,000 GBLs every month, and MTMC receives a copy of each. Depending on the geographic location of the issuing activity, the

GBLs are sent to either MTMC Bayonne (Eastern Area) or MTMC Oakland (Western Area). Currently all copies are now sent by mail. In the near future, however, DLA activities will begin to provide MTMC with key data elements on magnetic tape.

Twice each year, the MTMC area offices manually screen 10 percent of the GBLs prepared by each issuing activity. The objective of these reviews is to assure that the issuing activities are preparing GBLs properly.

In addition to performing quality checks on GBL preparation, MTMC assembles a comprehensive set of transportation movement data for passengers, cargo, freight, vehicles, and household goods. These data, encompassing some 90 data elements, are taken off each GBL and transmitted to Headquarters, MTMC via magnetic tape for entry into FINS. That system first edits and validates the data; then it produces a comprehensive set of transportation movement reports. Those reports are used largely to (1) assure that carriers are chosen fairly, (2) determine traffic pattern trends, (3) conduct various traffic analyses, and (4) compute future requirements for transportation funding.

The finance centers mail to Headquarters, MTMC copies of every paid GBL for which discrepancies greater than \$1,000 exist between the estimated freight charges on the GBL and the actual charges. Headquarters, MTMC, in turn, transmits the GBL information via modems to the area offices for manual auditing. The results are then transmitted back to Headquarters, MTMC, and the audited GBLs are mailed to GSA for collection. Through an agreement with GSA, MTMC audits approximately 150 of these GBLs per month.

## APPENDIX D

### DEMONSTRATION PLAN

This appendix presents a plan and timetable for demonstrating the feasibility of using Electronic Data Interchange (EDI) to transfer Government Bill of Lading (GBL) information electronically within the Department of Defense (DoD), and between DoD activities and commercial carriers. A secondary purpose of the demonstration is to identify the barriers to replacing the current GBL paper document flow with computer-to-computer exchange of GBL information.

#### MAJOR FEATURES

Specific features of the demonstration include:

- Participants. At a minimum, participants should include: a DoD shipper from the wholesale distribution network; several consignees to assure participation by each of the Military Departments; one or more motor carriers; a finance center to examine the invoicing and payment applications; and the Military Traffic Management Command (MTMC) which captures GBL data for its Freight Information System (FINS).
- Hardware. The demonstration should be conducted using microcomputers. This will result in less disruption to existing minicomputer/mainframe operating systems and will hold demonstration costs to a minimum.
- Software. Three types of software need to be developed, leased, or purchased at each activity participating in the demonstration: small-scale interface software, communications software, and translation software. (The communications and translation software will be either leased or purchased from commercial software vendors.)
- Telecommunications. Commercial telecommunications networks, supplemented with a value added or "electronic mailbox," should be used to transmit GBL information between participating activities.
- Volume. Initially, a small number of GBLs should be exchanged electronically. The number will grow as the participating activities become accustomed to exchanging GBLs electronically.

#### ESTIMATED COSTS

The demonstration design incorporates a low-cost approach for the DoD to examine the feasibility of electronically transferring GBL information within DoD. Table D-1 shows the estimated installation, or setup, cost and monthly operating cost by major cost component for each

**TABLE D-1. ESTIMATED INSTALLATION AND MONTHLY OPERATING COST  
FOR EACH PARTICIPATING ACTIVITY**

COST COMPONENT	COMMENT	ESTIMATED COST
<u>Installation Cost</u>		
Hardware	Includes microcomputer, modem, and cables	\$4,000 - \$7,000
Software	Includes interface, communications, and translation software	\$12,350 - \$19,200
<b>TOTAL</b>		<b>\$16,350 - \$26,200</b>
<u>Monthly Operating Cost</u>		
Personnel	Assumes each activity provides one person on a one-half time basis	\$1,600 - \$2,500
Telecommunications and Software Maintenance Fee	Provides for commercial value-added network	\$300 - \$500
<b>TOTAL</b>		<b>\$1,900 - \$3,000</b>

activity participating in the demonstration. Two of the cost components in the table — hardware and software — need amplification.

The microcomputer constitutes most of the hardware cost. However, if the activity can provide a microcomputer for the duration of the demonstration, this cost will be reduced substantially.

The demonstration software, which dominates all other demonstration costs, needs to satisfy three different requirements: interface, communication, and translation.

The interface software enables the downloading or uploading of GBL data between the demonstration microcomputer and the activity's mainframe computer. It will need to be developed jointly by a commercial software vendor and activity personnel. The vendor will identify the requirements and provide the specifications; activity personnel will then develop the software for linking the microcomputer with the mainframe.

The communications software ensures that the microcomputer and the activity's mainframe computer are compatible. This software will be purchased.

The translation software reformats DoD transportation data elements into EDI standards, and the EDI standards back into data elements used by DoD. This software will be either purchased or leased from a commercial software vendor.

Table D-2 provides the estimated cost for satisfying each of these software requirements. It also summarizes the purpose of each.

**TABLE D-2. SOFTWARE REQUIREMENTS AND ESTIMATED COSTS  
FOR EACH PARTICIPATING ACTIVITY**

SOFTWARE REQUIREMENT	SOURCE	PURPOSE	ESTIMATED COST
Interface Software	Develop	Developed through a combination of vendor and in-house effort <ul style="list-style-type: none"> <li>• Vendor identifies interface requirements and provides specifications for development (5 to 10 man-days at \$750 per day)</li> <li>• In-house personnel do the programming to satisfy requirements (5 to 15 man-days at \$200 per pay)</li> </ul>	\$4,750 – \$10,500
Communication Software	Purchase	Ensures computer compatibility through emulation of technical parameters	\$100 – \$1,200
Translation Software	Purchase or Lease	Translates existing GBL data elements into EDI code formats for transmission	\$7,500
<b>TOTAL</b>			<b>\$12,350 to \$19,200</b>

#### **DEMONSTRATION PLAN AND TIMETABLE**

Table D-3 identifies the major tasks to be accomplished during the demonstration and the associated timeframe for each. The tasks are structured into three phases: Concept



Refinement, Systems Development, and System Implementation. The balance of this section provides a brief overview of each phase by describing the tasks to be accomplished.

#### Concept Refinement

Solicit and Select Participants. In this task, representatives from the Military Departments, Defense Logistics Agency (DLA), Military Traffic Management Command (MTMC), and finance centers review demonstration concepts, suggest improvements, and select transportation activities that will participate in the demonstration. The selection should key on activities that have an automated GBL generation process, carriers who are willing to participate in the demonstration, and consignees within each of the Military Departments.

Prepare Functional Requirements. In this task, GBL information flows and specific data requirements of the transportation systems at participating activities are identified. Also, existing operating system software and hardware are reviewed to determine the level of effort required to make the DoD systems and EDI vendor software compatible.

Finalize Design and Resource Requirements. In this task, representatives from the Military Departments, DLA, MTMC, and finance centers review and approve the final demonstration design and associated resources.

#### System Development

Solicit, Assess, and Select Vendor. In this task, vendors who possess the required EDI software are assessed to determine their capability to support the demonstration; vendors who provide a full-service capability will be given priority.

Develop GBL Transaction Set. In this task, representatives from each of the participating activities assist in resolving all differences between the EDI Shipment Information transaction set standard and DoD GBL requirements. The product of this task will be a standardized GBL transaction set that uses EDI standard data elements to the maximum extent possible.

Develop Software. In this task, three types of software are developed, leased, or purchased at each activity participating in the demonstration. This task will be accomplished

through a combination of site and vendor effort, with the site effort being relatively small and confined to interface software development.

Procure Hardware. If the participating activities do not have access to microcomputers with the required capabilities, then this task entails leasing the necessary microcomputer and accessories based on vendor recommendations.

#### System Implementation

Install System. In this task, the hardware, software, and telecommunication links are installed, tested, and debugged.

Demonstrate System. The demonstration should be conducted for a minimum of 4 months. Participating sites will monitor the demonstration and provide feedback for improvements to standards, software, or telecommunication system.

Analyze and Report Results. In this task, the demonstration results are analyzed and a formal report on the demonstration presented. The report will focus on the issues and problems associated with the electronic exchange of GBL information and present recommendations for overcoming the barriers that they create.

TABLE D-3. DEMONSTRATION PLAN AND TIMETABLE

TASK DESCRIPTION	MONTHS															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I. <u>Concept Refinement</u> Solicit and Select Participants Prepare Functional Requirements Finalize Design and Resource Requirements																
II. <u>System Development</u> Solicit, Assess, and Select Vendor Develop GBL Transaction Set Develop Software Procure Hardware																
III. <u>System Implementation</u> Install System Demonstrate System Analyze and Report Results																

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